N 1550

WRIGHT CYCLONE ENGINES

Model: R1820-56, -66, -72

OPERATING INSTRUCTIONS

AUGUST, 1945

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SECTION I

INTRODUCTION

These instructions are published for the purpose of supplying operating recommendations, basic engine characteristics, and specific operating data for the Wright Cyclone 806C9HC1 (R-1820-56), 806C9HC3 (R-1820-66), and 806C9HC7 (R-1820-72) model engines without regard to the type or model of aircraft in which the engines may be installed.

The engine characteristics were taken from Engine Model Specification N806-B, variant B (-66), variant F (-72); the specific operating data which are recommendations only and do not represent Wright Aeronautical Corporation guarantees, were taken from Performance Curve SP-359-C and fuel flow curves SP-522, SP-523, SP-524, and SP-525.

These engine models, when equipped with torquemeters are designated 806C9HC2 (-56), 806C9HC4 (-66), and 806C9HC8 (-72) as covered in the Specification by variants A, C, and G respectively.

Engines provided with water injection are distinguished from those without by a "W" following the dash number of the military designation.

An "A" following the dash number indicates the engine has undergone modification to obtain the guaranteed ratings which were not maintained with the earlier model.

In this instruction the following operating conditions are referred to:

War Emergency Power: - The absolute maximum power output of an engine to be used only in a case of combat emergency when regard for engine life is not the most important consideration. Continuous operation is limited to five minutes. Ratings are obtained from the Bureau of Aeronautics since Wright Aeronautical Corporation neither recommends nor guarantees such ratings.

Military Rated Power: - The temperature limits, rpm, and manifold pressure conditions which represent the highest power available within the designed limits of the engine. In this instance, cylinder head temperatures of 232°C (450°F), cylinder base temperatures 163°C (325°F) maximum; 2600 rpm; 47 in. Hg manifold pressure, 1300 brake horsepower in supercharger low ratio; 44.5 in. Hg manifold pressure, 1000 brake horsepower in supercharger high ratio are specified for a maximum of 30 minutes duration.

Take-off Power: - The maximum temperature limits, rpm, and power rating recommended for take-off under the specified time limit. In this instance, cylinder head temperatures of 248°C (478°F) cylinder base temperatures 163°C (325°F); 2700 rpm; 48 in. Hg manifold pressure; 1350 brake horsepower are specified for a maximum of 5 minutes duration.

Normal Rated Power: - The maximum permissible temperature limits, rpm, and power rating for continuous operation. In this instance, cylinder head temperatures of 218°C (426°F), cylinder base temperatures 149°C (303°F); 2500 rpm; 43.5 in. Hg manifold pressure, 1200 brake horsepower in supercharger low

ratio; 40 in. Hg manifold pressure, 900 brake horsepower in supercharger high ratio are specified.

Cruising Powers: - Arbitrarily chosen rpm and power ratings less than normal rated which represent economical operation.

SECTION II

GENERAL OPERATING INSTRUCTIONS

PRE-STARTING

1. See that no tools or equipment are lying loose on or about the engine or airplane and that all fastenings are properly secured.

2. Check the fuel and oil supply for proper grade and quantity. Refer to section IV, Table of Engine Characteristics.

3. Examine the engine controls for smooth movement and full travel.

4. Set the following controls as indicated:

Cowl flaps	"OPEN"
Oil Cooler shutters	"CLOSED or "AUTOMATIC"
Carburetor air heater	"DIRECT"
Ignition switch	"OFF"
Mixture	"CUT-OFF"
Propeller	"INCREASE RPM" (low pitch)
Supercharger	"LOW" and locked

5. Turn the propeller in the normal direction of rotation at least two complete revolutions. If there is high compression, remove the spark plugs from the lower cylinders and drain all liquid as the presence of any quantity of liquid in a combustion chamber is likely to cause serious damage. Never turn the propeller opposite to engine rotation as this may force liquid into an intake pipe from where it is apt to be drawn back into the cylinder when the engine is started.

STARTING

1. Head the airplane into the wind for starting and all ground operation.

2. Adjust the following controls to the positions given:

Fuel supply valve	"ON"
Throttle	Set for a maximum of 1200 rpm

3. Build up the fuel pressure with the auxiliary fuel pump to the normal operating limits given in section IV, Specific Operating Data chart.

4. Engage the starter and operate the primer simultaneously.

5. After the propeller has made two revolutions, turn the ignition switch to "BOTH".

6. Operate the booster ignition if it is not connected to the starter switch. Should the engine fail to start within 30 seconds after starter engagement, let the starter cool, and then repeat the starting procedure.

7. When the engine is firing evenly, advance the mixture control to the "AUTO-RICH" position. Flick the primer as necessary and continue to operate the auxiliary fuel pump until the engine driven fuel pump is supplying sufficient pressure. Do not pump the throttle to obtain smooth operation. This practice causes a wide, rapid variation of the fuel-air ratio and may result in serious backfiring.

8. Observe the oil pressure gage. Stop the engine if the pressure does not register within five seconds or reach 40 lb per sq in. (2.81 kg per sq cm) in ten seconds.

WARM-UP

1. Conduct a thorough warm-up at approximately 1200 rpm before making any performance checks or before taxiing to take-off.

2. Do not close the cowl flaps in an attempt to shorten the warm-up period. This may result in cylinder fin cracking, burning of the ignition insulation, or other difficulties.

3. Keep the cowl flaps in "OPEN", the propeller control in the full "INCREASE RPM" (low pitch) position, the mixture control in "AUTO-RICH", and the supercharger control in "LOW" for all ground operation unless indicated otherwise in a performance check.

4. Continue the warm-up and keep the oil cooler shutters closed until the oil inlet temperature reaches the normal operating limits as specified in section IV. Open them as required to maintain these limits for all other operations.

PERFORMANCE CHECKS

Oil Pressure Check

1. Open the throttle to obtain not more than 30 in. Hg manifold pressure. If the oil pressure drops or fluctuates as engine speed is increased, extend the warm-up period.

2. Adjust the oil pressure relief valve if the oil pressure is not within limits at the oil inlet temperature specified for normal operation in section IV.

Ignition Switch Check

At the start of the day's flying it is necessary to check the "OFF" position of the ignition switch to assure proper connection of the ground wires.

1. Run the engine at approximately 700 rpm.

2. Turn the ignition switch to "OFF" momentarily to see if the engine stops firing.

3. Return to "BOTH" position.

Ignition System Check

1. Open the throttle to give 28 to 30 in. Hg manifold pressure.

2. If, under normal conditions, this opening gives an rpm in excess of 2400, reduce engine speed below 2400 rpm in the method applicable to the type of propeller used.

a. **Electric propellers:**

(1) Set the control in "MANUAL" and at an rpm slightly under 2400.

b. **Hydromatic propeller:**

(1) Set the control to govern at a speed just under 2400 rpm.

(2) Check the ignition quickly otherwise the automatic governing action will return the rpm to 2400 before any drop can be observed.

3. First note the rpm as the engine operates with the ignition switch in the "BOTH" position.

4. Place the ignition switch in the "LEFT" position and observe the rpm.

5. Return the switch to "BOTH" in order to stabilize speed.

6. Repeat this procedure for the "RIGHT" position.

7. Atmospheric conditions will influence the readings obtained, however, a drop of 75 rpm or less is considered normal providing no engine roughness is encountered.

Propeller Check

1. Run at 1500 rpm.

2. Note rpm reaction as control is placed in full high pitch "DECREASE RPM" position.

3. Return the control to low pitch position.

4. Check for reduction and full recovery of rpm.

Supercharger Clutch Shift Check

1. Open the throttle to obtain 1700 rpm.

2. Shift the supercharger clutch control to "HIGH" position.

3. Open the throttle to give a manifold pressure of 30 in. Hg and observe the engine rpm.

4. Shift the supercharger clutch back into "LOW" controlling the engine to 30 in. Hg with the throttle.

5. The engine rpm read at this condition should be approximately 150 rpm higher than the rpm noted previously when the supercharger was in the "HIGH" position.

Full Power Check

1. Advance controls in the following order to obtain take-off power:

Propeller
Throttle

Limit the time for this check to a minimum.

TAKE-OFF

1. Further warm-up may be necessary if the engine has cooled during taxiing.

2. Repeat the full power check after taxiing.

3. Place the carburetor air heater control on cold air unless icing is anticipated. Heat may be applied before and after the take-off, but do not apply it or during take-off.

4. Leave the mixture control in "AUTO-RICH" position and the supercharger control in "LOW".

5. Check the propeller control for take-off rpm.

6. Advance the throttle to give take-off power. Do not exceed take-off power limits or hold take-off power for longer than five minutes, however, do not take-off with less than full power since this results in improper cooling and in a hazardous and prolonged take-off.

7. Reduce power when clear of immediate take-off obstacles and obtain the desired climbing setting by retarding the following controls in the sequence given:

Throttle
Propeller

CLIMB

In climbing it may be necessary to readjust the oil cooler shutters, since the rate of oil cooling changes during ascent. Keep the carburetor air heater on the cold air supply unless icing occurs, and leave the mixture control in "AUTO-RICH" position for all climbing.

To increase power, first increase engine speed or rpm and then manifold pressure. To decrease power, reduce manifold pressure and then rpm. Each rpm setting has a recommended manifold pressure. Using more than the recommended manifold pressure value may increase detonation tendencies; using less generally results in increased fuel consumption.

Ignition System Check

1. Open the throttle to give 28 to 30 in. Hg manifold pressure.

2. If, under normal conditions, this opening gives an rpm in excess of 2400, reduce engine speed below 2400 rpm in the method applicable to the type of propeller used.

a. **Electric propellers:**

(1) Set the control in "MANUAL" and at an rpm slightly under 2400.

b. **Hydromatic propeller:**

(1) Set the control to govern at a speed just under 2400 rpm.

(2) Check the ignition quickly otherwise the automatic governing action will return the rpm to 2400 before any drop can be observed.

3. First note the rpm as the engine operates with the ignition switch in the "BOTH" position.

4. Place the ignition switch in the "LEFT" position and observe the rpm.

5. Return the switch to "BOTH" in order to stabilize speed.

6. Repeat this procedure for the "RIGHT" position.

7. Atmospheric conditions will influence the readings obtained, however, a drop of 75 rpm or less is considered normal providing no engine roughness is encountered.

Propeller Check

1. Run at 1500 rpm.

2. Note rpm reaction as control is placed in full high pitch "DECREASE RPM" position.

3. Return the control to low pitch position.

4. Check for reduction and full recovery of rpm.

Supercharger Clutch Shift Check

1. Open the throttle to obtain 1700 rpm.

2. Shift the supercharger clutch control to "HIGH" position.

3. Open the throttle to give a manifold pressure of 30 in. Hg and observe the engine rpm.

4. Shift the supercharger clutch back into "LOW" controlling the engine to 30 in. Hg with the throttle.

5. The engine rpm read at this condition should be approximately 150 rpm higher than the rpm noted previously when the supercharger was in the "HIGH" position.

Full Power Check

1. Advance controls in the following order to obtain take-off power:

Propeller
Throttle

Limit the time for this check to a minimum.

TAKE-OFF

1. Further warm-up may be necessary if the engine has cooled during taxiing.

2. Repeat the full power check after taxiing.

3. Place the carburetor air heater control on cold air unless icing is anticipated. Heat may be applied before and after the take-off, but do not apply it or during take-off.

4. Leave the mixture control in "AUTO-RICH" position and the supercharger control in "LOW".

5. Check the propeller control for take-off rpm.

6. Advance the throttle to give take-off power. Do not exceed take-off power limits or hold take-off power for longer than five minutes, however, do not take-off with less than full power since this results in improper cooling and in a hazardous and prolonged take-off.

7. Reduce power when clear of immediate take-off obstacles and obtain the desired climbing setting by retarding the following controls in the sequence given:

Throttle
Propeller

CLIMB

In climbing it may be necessary to readjust the oil cooler shutters, since the rate of oil cooling changes during ascent. Keep the carburetor air heater on the cold air supply unless icing occurs, and leave the mixture control in "AUTO-RICH" position for all climbing.

To increase power, first increase engine speed or rpm and then manifold pressure. To decrease power, reduce manifold pressure and then rpm. Each rpm setting has a recommended manifold pressure. Using more than the recommended manifold pressure value may increase detonation tendencies; using less generally results in increased fuel consumption.

Those engines provided with water injection have a regulator located between the linkage of the cockpit throttle control lever and the carburetor throttle lever which, as the throttle is positioned to give the desired manifold pressure, maintains the manifold pressure selected throughout all flight conditions up to the critical altitude of that setting. As a climb is made, the manifold pressure regulator opens the carburetor throttles until the critical altitude is reached after which further movement of the cockpit throttle control lever has no effect.

When the throttle is advanced to the full boost position beyond take-off power, the engine is operating at war emergency or combat power. This power is available in either high or low supercharger ratio, as a "dry" rating, or in supercharger high ratio with water injection, as a "wet" rating.

Make all shifts with the mixture control in "AUTO-RICH" and when shifting from "LOW" to "HIGH", adjust the propeller control to maintain at least 1700 rpm. Shift rapidly, locking the supercharger clutch control at the extremity of its travel and, after the shift, readjust both throttle and propeller for the desired manifold pressure and rpm. Never operate with the supercharger clutch control in an intermediate position, nor shift more often than once in five minutes.

CRUISE

When operating at a power above 70 percent of normal rated, keep the mixture control in the "AUTO-RICH" position, at and below 70 percent, use "AUTO-LEAN". Do not lean the mixture manually, at any time.

For optimum economy of the engine, operate at the maximum recommended limits of 140 BMEP. Excessive fuel consumption will result when the manifold pressure is too low for a given rpm.

The supercharger high ratio should not be used at altitudes where cruising power is available in low ratio since greater fuel economy is obtainable in low ratio.

DIVE

1. Adjust the cowl flaps and oil cooler shutters to prevent too rapid cooling.

2. Set the following controls as indicated:

Carburetor air heater	"DIRECT"
Mixture	"AUTO-RICH"
Propeller	Decrease rpm as necessary
Supercharger	"LOW" and locked

3. Close the throttle gradually as the airplane speed increases, yet maintain sufficient opening to prevent too rapid cooling. The position of the throttle depends on the angle of the dive and is determined by experience.

4. Do not exceed the maximum engine overspeed. Refer to rating in section IV, Specific Operating Data chart.

GLIDE

1. Close the oil cooler shutters.

2. Keep the carburetor air heater on the cold air supply during a normal glide unless icing occurs. However, on making the final glide in an approach for a landing, the heater must be on cold air supply.

3. Place the mixture control in "AUTO-RICH".

4. Lock the supercharger in "LOW".

5. When making a final approach for landing, set the propeller control to give normal rated rpm and reduce power by closing the throttle.

6. On a "go-around", open the throttle as wide as necessary, and then advance the propeller control to give take-off rpm. Maintain full power until a safe airspeed is reached.

STOPPING

1. Place the propeller control in the full "INCREASE RPM" (low pitch) position.

2. Leave the supercharger control in "LOW".

3. If the engine has been warmed by taxiing, idle until the cylinder head temperatures drop to a maximum of 150°C (300°F) or to a value consistent with existing atmospheric temperatures.

4. Operate the oil dilution valve before stopping if the air temperature warrants diluting the oil.

5. Immediately before shutting down, scavenge the crankcase oil by opening the throttle to give 1000 to 1200 rpm maximum for at least 30 seconds.

6. Place the mixture control in "CUT-OFF".

7. Turn the ignition switch off when the propeller has stopped turning.

8. Close the fuel shut-off valves.

9. Cover all openings if the engine is to be idle for an extended period of time or if dusty conditions exist.

SECTION III

METHOD OF READING PERFORMANCE CURVES

For operation of the engine at any power output, it is necessary to properly correlate horsepower, rpm, manifold pressure and mixture strength in order to insure optimum performance and reliability. Experience with the engine being considered indicates that the propeller load curve gives the desired combination of these factors in the higher horsepower range. In the Auto-Rich section of the Sea Level Performance Curve shown in section IV, the end points of the constant rpm lines are determined by propeller load conditions as is the 2200 rpm line in Auto-Lean. A line drawn through these end points would be the approximate propeller load curve for which the combinations listed below have been established.

PROPELLER LOAD VALUES AT SEA LEVEL

RPM	HP	MAP	MIXTURE
2500	1200	44 in. Hg	Auto-Rich
2400	1175	40.5 in. Hg	Auto-Rich
2300	915	36.5 in. Hg	Auto-Rich
2220 (70% N.R.)	840	34 in. Hg	Auto-Lean
2200	820	34 in. Hg	Auto-Lean

It is not desirable to deviate from these values to make the manifold pressure greater for a given rpm than that given in the table. Greater manifold pressures produce high temperature and pressure conditions very often conducive to detonation--lower manifold pressures generally result in a slight loss of economy because of the rpm being higher than necessary for the power being used. To estimate the same rpm and BHP conditions at altitude it is necessary to reduce the manifold pressure approximately 1 in. Hg per 3000 feet altitude. For rpm values in this range other than those given in the table, it is possible to draw in the propeller load curve through the end points previously discussed and read off intermediate values of horsepower and manifold pressure for any rpm.

In the lower horsepower range a more economical combination of rpm and manifold pressure may be obtained from constant BMEP operation. BMEP, brake mean effective pressure, is defined in the relation:

$$HP = \frac{BMEP\ (rpm)}{K} \quad \text{or} \quad BMEP = \frac{HP\ (K)}{rpm}$$

The figure K represents a combination of all items of the horsepower formula, except rpm, that remains constant for each engine series. For the Cyclone 9HC engine this constant is 435.

Since, in the desired operating range, constant brake mean effective pressure operation requires higher manifold pressures for given rpm than the propeller load operation, the tendency to detonate is increased. Therefore, it is necessary to limit this type of operation to a range in which no detonation will occur. Test data indicate that with normal operating conditions, no detonation will occur in this engine below 140 lb per sq in. brake mean effec-

tive pressure. The end points of the constant rpm lines in the Auto-Lean section of the Sea Level grid up to 2100 rpm have been determined for operation at 140 BMEP and thus a line drawn through these points would be the 140 BMEP curve. The 2100 rpm line is at the intersection point of the propeller load curve and the 140 BMEP curve therefore, operation above 2100 rpm may be carried out along the propeller load curve or in accordance with the table given above, and operations below 2100 rpm may be carried out at or below 140 BMEP, or in accordance with the table listed below, if 140 BMEP is to be used. As with operation on propeller load, it is necessary to reduce the manifold pressure approximately 1 in. Hg per 3000 feet altitude to estimate the same rpm and BHP conditions at altitude.

140 BMEP VALUES AT SEA LEVEL

RPM	HP	MAP	MIXTURE
2100	690	30.5 in. Hg	Auto-Lean
1900	610	31 in. Hg	Auto-Lean
1700	550	31.5 in. Hg	Auto-Lean
1500	490	31 in. Hg	Auto-Lean
1300	405	31 in. Hg	Auto-Lean

It is also possible to operate at a constant BMEP lower than 140, but maximum engine economy will usually be obtained with operation near the maximum BMEP limit (140 BMEP in this instance).

On the Altitude Performance Curve in section IV, the horsepower and rpm conditions determined by the propeller load curve and the 140 BMEP curve have been plotted at their critical altitude conditions. The dotted lines then represent the conditions of horsepower, rpm, and altitude for wide open throttle. Part throttle operation is indicated by the construction to the left of the dotted lines and full throttle operation is indicated by construction to the right of the dotted lines.

The very heavy line dividing the performance curves horizontally into Auto-Rich and Auto-Lean mixture operation is drawn at the point of maximum cruising power which is 70 percent of rated power. All operation above this power should be conducted with the mixture control in "AUTO-RICH"; below this line, cruising power level flight is made in "AUTO-LEAN" as indicated but this section of the curve is also suitable for determining manifold pressure and horsepower with the mixture control in "AUTO-RICH" for climbing at cruising power.

These curves are drawn for standard altitude temperatures and pressures without ram and using the approved fuel. A few examples will show how these curves may be used to find a particular horsepower or manifold pressure condition at any altitude between the range of sea level and critical altitude as well as determining full throttle conditions or locating rpm.

Example I - To find the critical altitude, locate the intersection of at least two of these lines--constant rpm; full throttle MAP; or BHP, as drawn horizontally from the scale on the left. Read vertically from this intersection point to the altitude scale in feet at the bottom of the grid. Any of these four operating conditions can be found by locating the intersection of two of the known factors.

Example II - To determine the brake horsepower at any point from sea level up to full throttle when operating with the constant MAP-rpm method of power control, proceed in the following manner:

Locate the intersection of the particular rpm-MAP combination on the Sea Level curve. Read horizontally to the horsepower scale on the left. Transfer this point to the corresponding horsepower scale on the extreme left of the Altitude Performance curve. Draw a line from this sea level horsepower point on the altitude curve to the intersection of the rpm-MAP combination (critical altitude). The horsepower can be found at any altitude by reading horizontally to the left from the selected altitude point along this sloping line. To find the same conditions by another method and without using the Sea Level curve, merely locate the intersection of rpm-MAP on the altitude grid. Draw a line through this point parallel to the nearest sloping constant MAP-rpm line found already drawn to the left of the dotted prop load line, in the Auto-Rich section of the curve and read horsepower from the scale on the left.

Example III - To determine manifold pressure at sea level when conducting a climb with constant BHP-rpm power conditions, simply read the vertical scale at the end points of the rpm lines on the Sea Level Performance grid. Plotting this point without the assistance of a Sea Level curve will give an approximate value since this method requires extending the full throttle, rpm and MAP lines into the part throttle construction. Locate the selected horsepower on the horizontal axis of the altitude curve. Through this point draw a line parallel to the sloping lines discussed in example II. At the intersection of this new line with the extended rpm line, the manifold pressure will be equivalent of that at sea level. To find the manifold pressure at any point between sea level and critical altitude, reduce the value approximately 1 in. Hg per 3000 feet increase in altitude.

Example IV - Manifold pressure for cruise conditions can be read from the part throttle constructions at any point along the horizontal lines.

If the actual carburetor air temperature T (^{o}F) varies from the standard altitude temperature Ts (^{o}F), modify the chart brake horsepower by 1 percent for each 10°F variation to obtain the actual brake horsepower. The actual brake horsepower is greater than chart brake horsepower when T is less than Ts and less when T is greater than Ts.

SECTION IV

ENGINE CHARACTERISTICS AND SPECIFIC OPERATING DATA

TABLE OF ENGINE CHARACTERISTICS

Series	Cyclone 9HC
Model	806C9HC1 (R-1820-56) 806C9HC2 (R-1820-56 with torquemeter) 806C9HC3 (R-1820-56) 806C9HC4 (R-1820-66 with torquemeter) 806C9HC7 (R-1820-72) 806C9HC8 (R-1820-72 with torquemeter)
Type	Single-row static radial, air cooled
Number of Cylinders	9
Bore	6.125 in.
Stroke	6.875 in.
Piston Displacement	1823 cu in.
Compression Ratio	6.55:1
Impeller Gear Ratio	7.134 and 10.04:1
Impeller Diameter	11 in.
Rotation of Crankshaft (From rear)	Clockwise
Rotation of Propeller Shaft (From rear)	Clockwise
Propeller Reduction Gear Ratio	666:1
Propeller Shaft	No. 50
Fuel	AN-F-28 and N2, Grade 100/130
Oil	AN-VV-O-446a, Grade 1120
Type of Carburetor	Stromberg PD-12K10
Type of Magneto	Edison-Splitdorf SF9LD-1
Maximum Engine Overspeed during Dive	3100 RPM
Fuel Pressure	15 to 19 lb per sq in. (1.06 to 1.34 kg per sq cm)
Oil Pressure	65 to 75 lb per sq in. (4.57 to 5.28 kg per sq cm)
Oil Inlet Temperature	
Desired	70 to 85°C (158 to 185°F)
Normal Maximum	93°C (200°F)
Emergency	104°C (220°F)

Cylinder head temperature for ground operation 260°C (500°F) maximum

SPECIFIC OPERATING DATA

OPERATING CONDITION	RPM	MAP IN.HG	BHP	CRITICAL ALTITUDE FT.	SUPER-CHARGER RATIO	MIXTURE CONTROL POSITION	APPROX. FUEL CONS. GAL/HR	OIL CONS. QT/HR	HEAD TEMP. MAXIMUM °C	HEAD TEMP. MAXIMUM °F	BASE TEMP. MAXIMUM °C	BASE TEMP. MAXIMUM °F
Take-Off -56A,-66A,-72A	2700	48	1350	Sea Level	Low	"AUTO-RICH"	162	18	248	478	163	325
(5 Minutes) -56,-66,-72	2600	46½	1300									
Military Rated	2600	47	1300	1,300	Low		152					
(30 Minutes)	2600	44.5	1000	14,500	High	"AUTO-RICH"	132	18	232	450	163	325
Normal Rated	2500	43.5	1200	2,500	Low		136					
(Continuous at 100%)	2500	40	900	17,000	High	"AUTO-RICH"	110	16	218	426	149	303
Cruise	2220	34	840		Low		75					
(70% on Prop Load)	2220	30	630	**	High	"AUTO-LEAN"	58	9	205	400	149	303
Cruise	2000	30.5	645				48	7				
(140 BMEP)	1900	30.5	620				45	6				
	1800	31	580	**	Low	*"AUTO-LEAN"	42	6	205	400	149	303
	1600	31	515				37	5				
	1400	30.5	455				33	5				

Remarks: * Use "AUTO-LEAN" for level flight and "AUTO-RICH" for a climb.

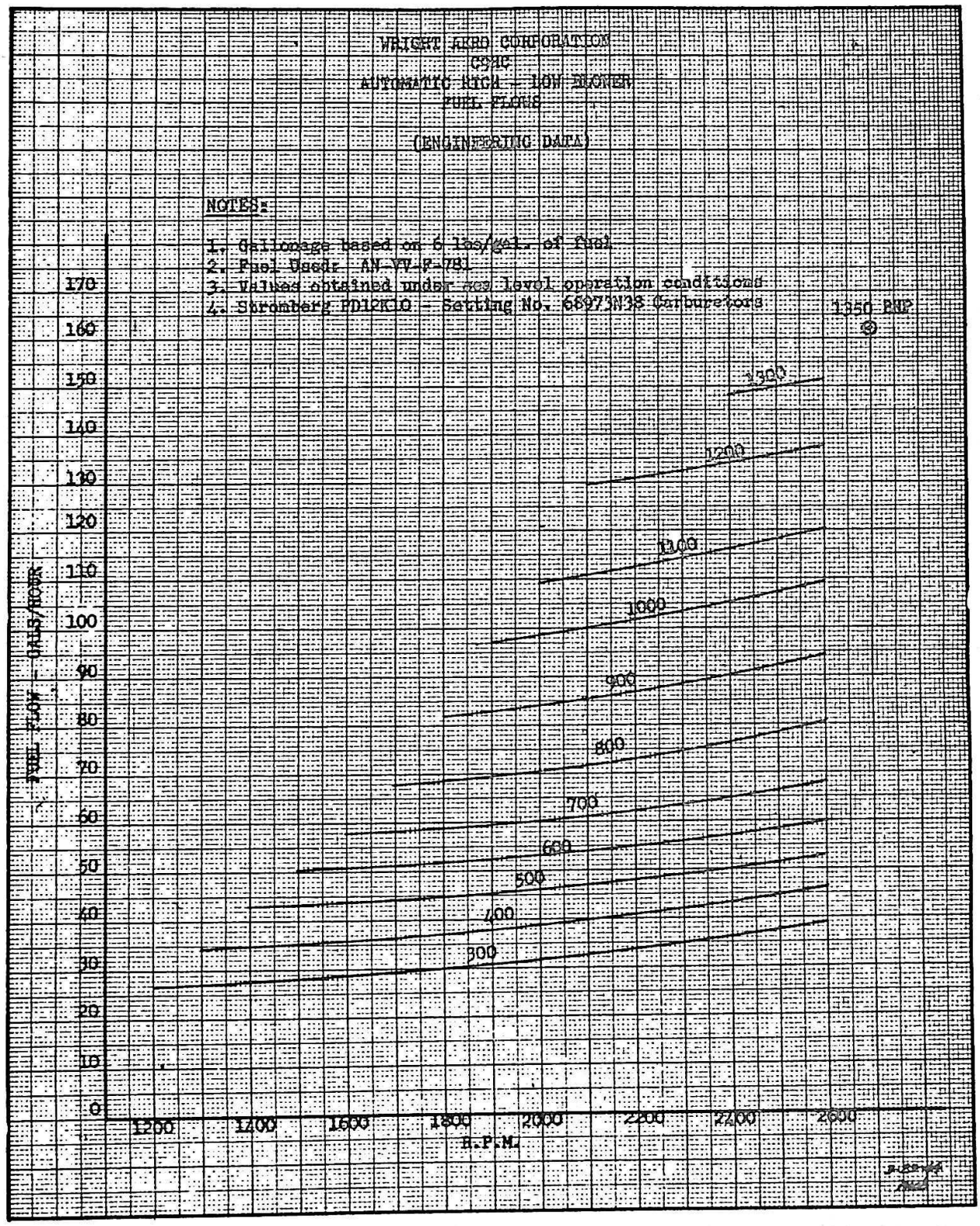
** Cruising part throttle operation with the manifold pressure readings taken at normal rated critical altitudes.

WRIGHT AERO CORPORATION
G5MC
AUTOMATIC RICH - LOW BLOWER
FUEL FLOWS

(ENGINEERING DATA)

NOTES:

1. Gallonage based on 6 lbs/gal. of fuel
2. Fuel Used: AN-VV-F-781
3. Values obtained under sea level operation conditions
4. Stromberg PD12K1Q - Setting No. 68973N38 Carburetors

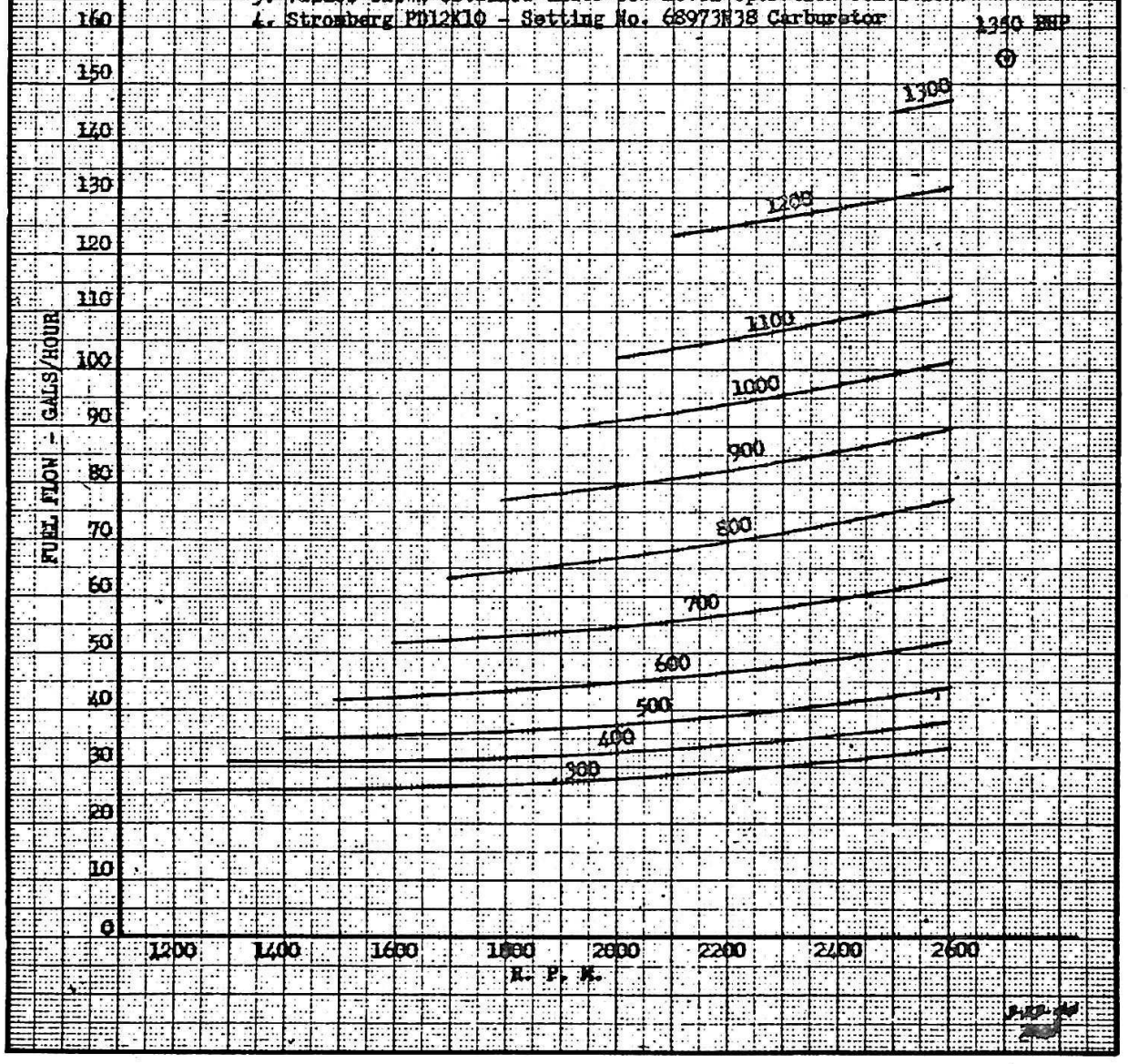


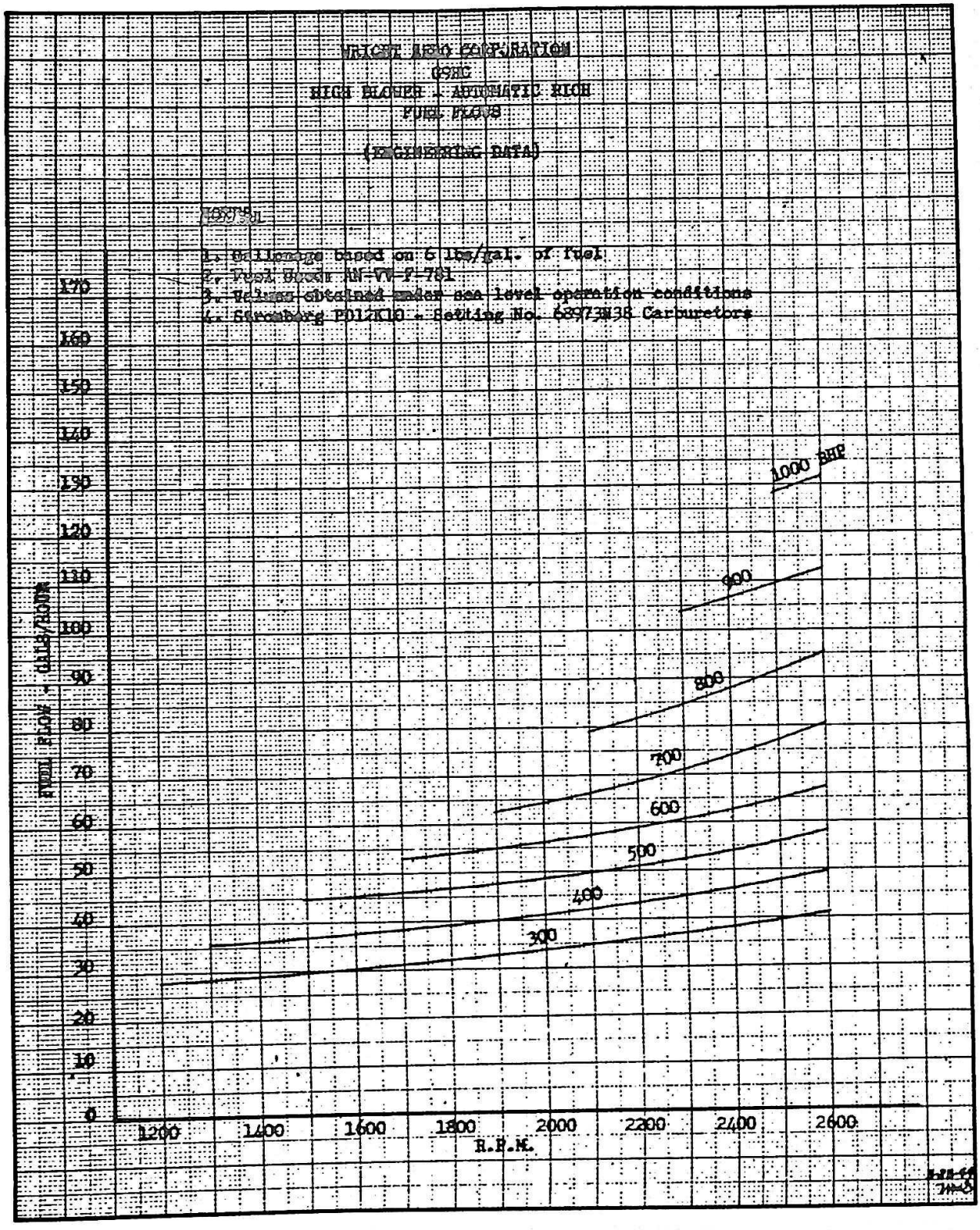
WRIGHT AERO CORPORATION
C9HC
AUTO LEAN - LOW BLOWER
FUEL FLOWS

(ENGINEERING DATA)

NOTES:

1. Gallonage based on 6 lbs/gal. of fuel
2. Fuel Used: AN-VV-F-781
3. Values shown obtained under sea level operation conditions
4. Stromberg PD12K10 - Setting No. 68973N38 Carburetor



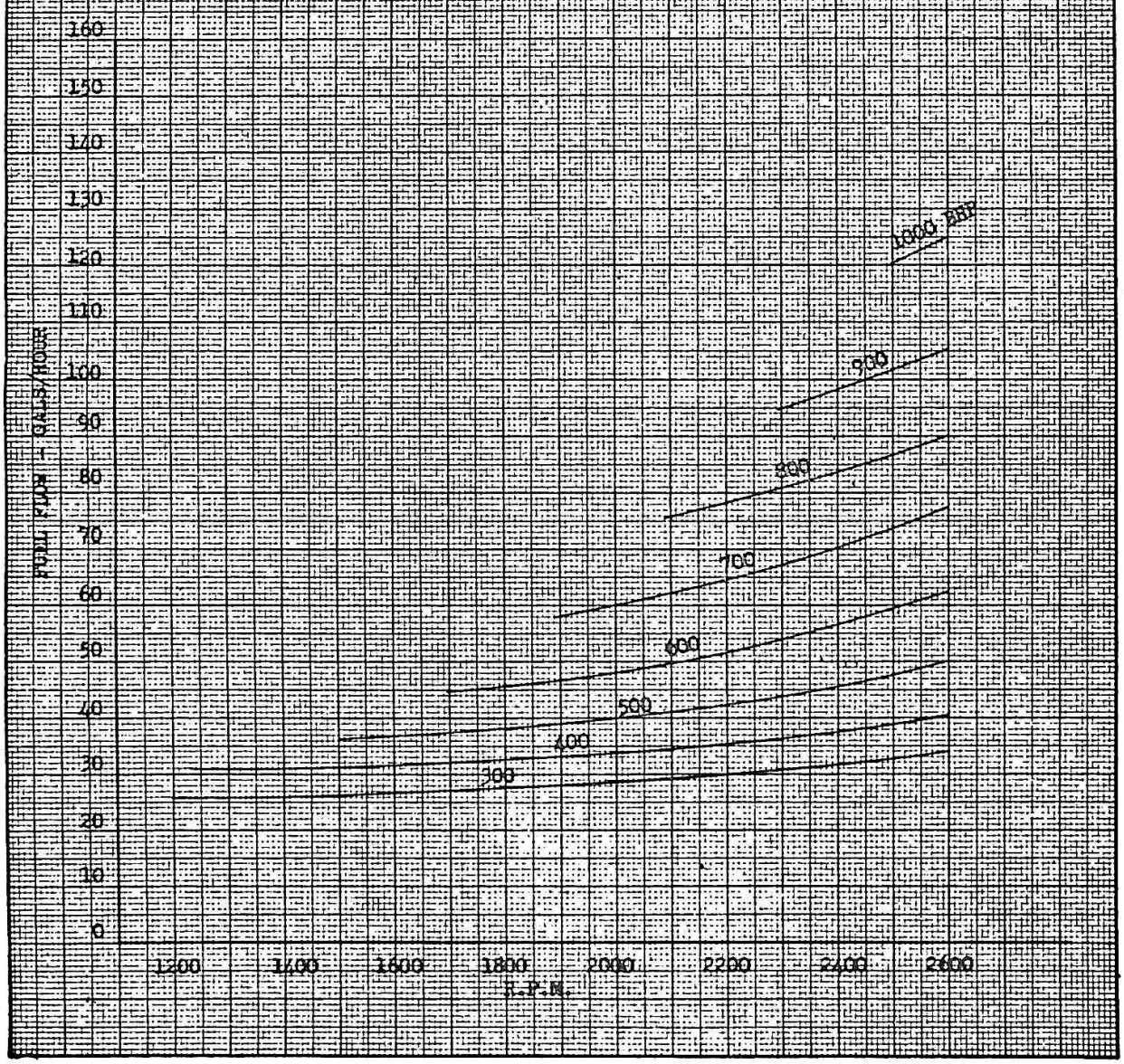

WRIGHT AERO CORPORATION
G9HC
HIGH BLOWER - AUTOMATIC RICH
FUEL FLOW
(ENGINEERING DATA)
1. Gallonage based on 6 lbs/gal. of fuel
2. Test Stand AN-VV-F-781
3. Values obtained under sea level operation conditions
4. Stromberg PD12K10 - Setting No. 68973N38 Carburetors
FUEL FLOW - GALS/HOUR
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
1200
1400
1600
1800
2000
2200
2400
2600
R.P.M.
1000 BHP
900
800
700
600
500
400
300

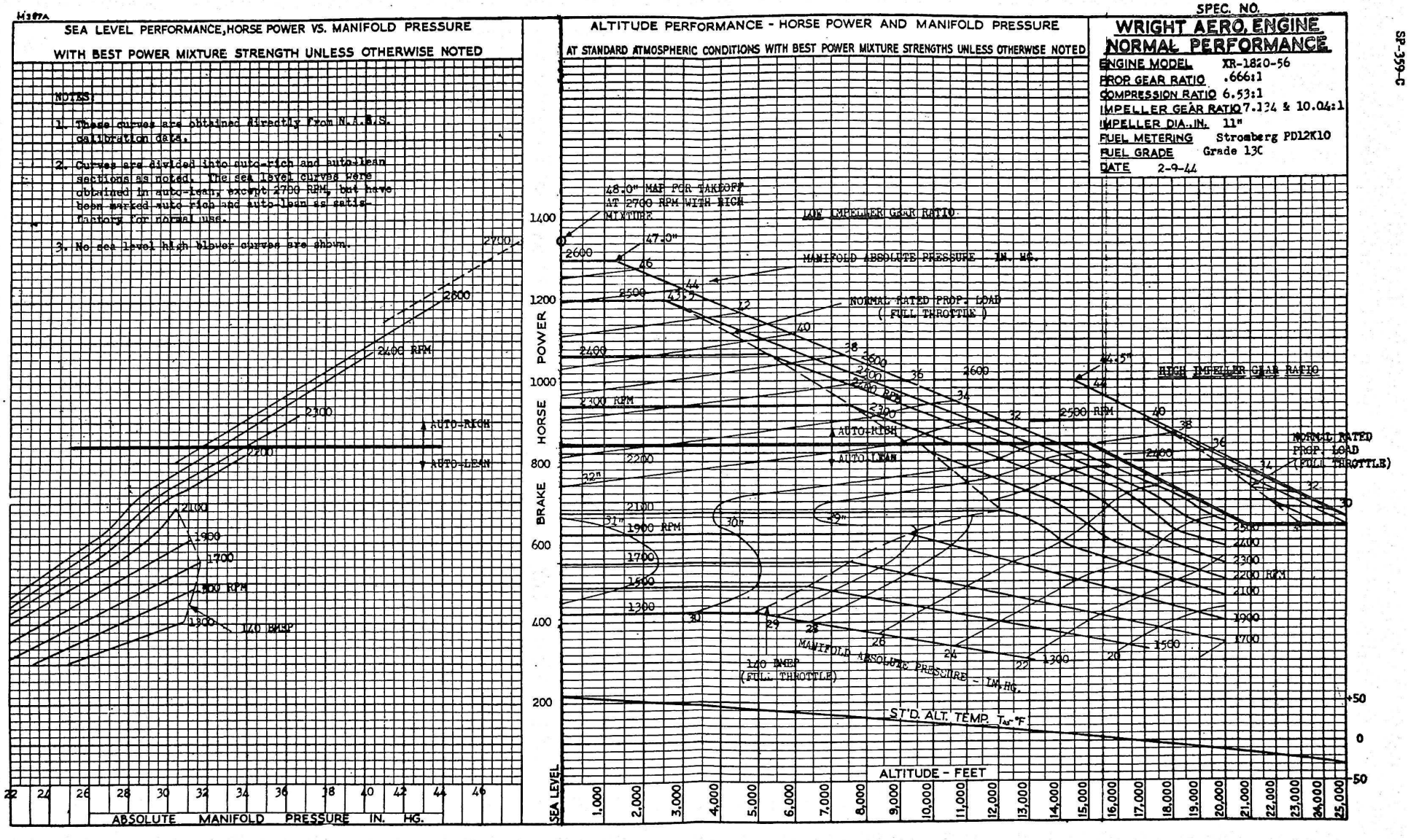
WRIGHT AERO CORPORATION
G9HC
AUTOMATIC-LEAN - HIGH BLOWER
FUEL FLOWS

(ENGINEERING DATA)

NOTES:

1. Gallonage based on 6 lbs/gal. of fuel
2. Fuel Used: AN-VV-F-782
3. Values obtained under sea level operation conditions
4. Stromberg PD12K10 - Setting No. 68973238 Carburetors




SEA LEVEL PERFORMANCE, HORSE POWER VS. MANIFOLD PRESSURE
WITH BEST POWER MIXTURE STRENGTH UNLESS OTHERWISE NOTED
NOTES:
1. These curves are obtained directly from N.A.R.S. calibration data.
2. Curves are divided into auto-rich and auto-lean sections as noted. The sea level curves were obtained in auto-lean, except 2700 RPM, but have been marked auto rich and auto-lean as satisfactory for normal use.
3. No sea level high blower curves are shown.
AUTO-RICH
AUTO-LEAN
2700
2600
2500 RPM
2400 RPM
2300
2200
2100
1900
1700
1500 RPM
1300
120 BMEP
ABSOLUTE MANIFOLD PRESSURE IN. HG.
ALTITUDE PERFORMANCE - HORSE POWER AND MANIFOLD PRESSURE
AT STANDARD ATMOSPHERIC CONDITIONS WITH BEST POWER MIXTURE STRENGTHS UNLESS OTHERWISE NOTED
48.0" MAP FOR TAKEOFF AT 2700 RPM WITH RICH MIXTURE
LOW IMPELLER GEAR RATIO
MANIFOLD ABSOLUTE PRESSURE IN. HG.
NORMAL RATED PROP. LOAD (FULL THROTTLE)
HIGH IMPELLER GEAR RATIO
2500 RPM
2400
2300
2200
2100
1900 RPM
1700
1600
1300
120 BMEP (FULL THROTTLE)
MANIFOLD ABSOLUTE PRESSURE - IN. HG.
ST'D. ALT. TEMP. T_{ss} °F
BRAKE HORSE POWER
ALTITUDE - FEET
SEA LEVEL
SPEC. NO.
WRIGHT AERO. ENGINE
NORMAL PERFORMANCE
ENGINE MODEL XR-1820-56
PROP GEAR RATIO .666:1
COMPRESSION RATIO 6.53:1
IMPELLER GEAR RATIO 7.134 & 10.04:1
IMPELLER DIA. IN. 11"
FUEL METERING Stromberg PD12K10
FUEL GRADE Grade 13C
DATE 2-9-44